Contents

Conference Photograph vi

Preface vii

Conference Information viii

Contents ix

Chapter 1. Coherent, ultrafast and nonlinear spectroscopy

Theory of coherent effects in semiconductors
S.W. Koch, C. Sieh, T. Meier, F. Jahnke, A. Knorr, P. Brick, M. Hübner, C. Ell, J. Prineas, G. Khitrova, H.M. Gibbs 1

Ultrafast nonlinear absorption of quantum well excitons periodically distributed in a Bragg reflector
K. Ogawa 7

Femtosecond dynamics of self-trapped excitons in quasi-one-dimensional halogen-bridged Pt complexes
T. Suemoto, S. Tomimoto 13

Excitonic structures and optical responses of antiferromagnetic La_2CuO_4
E. Hanamura, Y. Tanabe, N.T. Dan 19

Picosecond and femtosecond studies of the energy redistribution in matrix-isolated C_{60} molecules
A. Sassara, G. Zerza, V. Ciulin, M.T. Portella-Oberli, J.-D. Ganière, B. Deveaud, M. Chergui 29

Ultrafast electron transport phenomena in highly excited gold films
A. Hibara, T. Morishita, I. Tsuyumoto, T. Kitamori, T. Sawada 33

Observation of picosecond nonlinear optical response from porous silicon
H. Liu, L. F. Fonseca, S.Z. Weisz, W. Jia, O. Resto 37

Effects of solvent fluctuations on coherent Raman scattering
I. Tehver 43

Hot carrier relaxation dynamics in $In_{0.53}Ga_{0.47}As$ studied by femtosecond pump–probe spectroscopy
D. Nishiwaki, Y. Hamanaka, Y. Nonogaki, Y. Fujiwara, Y. Takeda, A. Nakamura 49

Photon avalanche in Pr^{3+}: $LaCl_3$
D.B. Gatch, S.A. Holmstrom, W.M. Yen 55

Chaper 2. Generation and dynamics of excitons, polarons and localized excitations

Frenkel excitons in one-dimensional systems with correlated disorder
F. Domínguez-Adame, V.A. Malyshev 61

Exciton relaxation by phonon scattering in Cu_2O
H. Haug 69

Self-induced transparency at bound excitons in CdS
M. Jütte, W. von der Osten 77

Dynamics of excitonic magnetic polarons in nanostructure diluted magnetic semiconductors
Y. Oka, J. Shen, K. Takabayashi, N. Takahashi, H. Mitsu, I. Souma, R. Pittini 83

Charge transfer vibronic excitons in ferroelectric oxides: experiment and theory
V.S. Vikhnin, H. Liu, W. Jia, S. Kapphan 91

Coherent transient phenomena of confined excitons in CuCl nanocrsytals: non-Markovian dephasing and quantum beats
A. Nakamura, H. Ohmura 97

Towards proper parametrization in the exciton transfer and relaxation problem
I. Barvík, V. Čápek, P. Heřman 105

Critical effects in optical response due to charge transfer vibronic excitons and their structure in perovskite-like systems
V.S. Vikhnin, H. Liu, W. Jia, S. Kapphan, R. Eglitis, D. Usvyat 109

Can the exciton delocalization length in molecular aggregates be determined by pump–probe spectroscopy?
L.D. Bakalis, J. Knoester 115

Scanning near field exciton microscopy
E. Paule, P. Reineker 121

Spectral diffusion within exciton line in GaSe
A. Hasegawa, F. Minami 127

Numerical study of absorption spectra of Frenkel excitons in two-dimensional disordered lattices with long-range dipole–dipole interaction
A. Rodríguez, V.A. Malyshev, F. Domínguez-Adame 131

Dynamics of electronic "bubble" formation in solid hydrogen
F. Vigliotti, C. Jeannin, M.T. Portella-Oberli, M. Chergui, R. Scholz 135

Chapter 3. Electron–phonon interaction and non-radiative processes

Electron–phonon interaction in rare earth doped nanocrystals
H.-S. Yang, K.S. Hong, S.P. Feofilov, B.M. Tissue, R.S. Meltzer, W.M. Dennis 139

The weak, the large, and the empty: bringing order to concepts of spatial coherence in the Holstein polaron
A.H. Romero, D.W. Brown, K. Lindenberg 147

Electron–phonon quantum kinetics in the strong coupling regime
D. Steinbach, G. Kocherscheidt, M.U. Wehner, H. Kalt, M. Wegener, K. Ohkawa, D. Hommel 155

Phonon dynamics in amorphous and nanocrystalline silicon
M. van der Voort, A.V. Akimov, O.L. Muskens, J.I. Dijkhuis, N.A. Feoktistov, A.A. Kaplyanskii, A.B. Pevtsov 161

Two-photon absorption in strong fields
M. Alexanian, S. Bose 167

Multiphonon sideband intensities in rare earth ions in crystal
K.K. Pukhov, T.T. Basiev, J. Heber, S. Mirov, F. Auzel 171

Energy transfer assisted by localized excitations in amorphous solids
A.J. García, R. Balda, J. Fernández 177

Free-electron laser experiments on Si–H vibrations in a-Si : H
M. van der Voort, C.W. Rella, A.F.G. van der Meer, A.V. Akimov, J.I. Dijkhuis 183

Size-dependent optical properties of silicon nanocrystals
R.K. Soni, L.F. Fonseca, O. Resto, M. Buzaianu, S.Z. Weisz 187

Chapter 4. Energy transfer in crystals and disordered materials

Fluorescence dynamics in 1D systems with phonon-assisted energy transfer
I. Avgin, D.L. Huber 193

Temperature-dependent luminescence and energy transfer in europium and rare earth codoped nanostructured xerogel and sol–gel silica glasses
S. Buddhudu, M. Morita, S. Murakami, D. Rau 199

Photo-induced bond switching in amorphous chalcogenides
A.V. Kolobov, H. Oyanagi, M. Kondo, A. Matsuda, A. Roy, K. Tanaka 205

Non-radiative relaxation of Yb^{3+} in highly porous γ-Al_2O_3
J.K. Krebs, S.P. Feofilov, A.A. Kaplyanskii, R.I. Zakharchenya, U. Happek 209

Low-temperature luminescence and energy transfer processes in Eu^{3+}, Nd^{3+}, and Cr-doped sol–gel PLZT ceramics
S. Murakami, M. Herren, D. Rau, T. Sakurai, M. Morita 215

Chapter 5. Photoexcitation of single molecules and bioluminescence

Spectral lines of single molecules in a fluctuating environment
T. Plakhotnik 221

Disorder-induced exciton scattering in molecular aggregates
J.P. Lemaistre 229

Comparison of two models for bridge-assisted charge transfer
M. Schreiber, D. Kilin, U. Kleinekathöfer 235

Nonlinear absorption and optical limiting of fullerene complex C_{60}[$W(CO)_3$diphos] in toluene solutions and sol gel films
K. Dou, J.Y. Du, E.T. Knobbe 241

Computer simulation of the exciton transfer in the coupled ring antenna subunits of bacteria photosynthetic systems
P. Heřman, I. Barvík 247

Protoporphyrin IX fluorescence from the plasma of tumor-implanted mouse
J.W. Meng, X.J. Wang, H.P. Ma, X.G. Ren, X.R. Xu, W.M. Ren 251

The distribution of line widths of single probe molecules in a crystalline host at milliKelvin temperatures
E.A. Donley, V. Burzomato, U.P. Wild, T. Plakhotnik 255

Single- and countable-molecule detection of non-fluorescent molecules in liquid phase
M. Tokeshi, M. Uchida, K. Uchiyama, T. Sawada, T. Kitamori 261

Cooperative disordering processes in J-aggregates – difference absorption spectra caused by dynamical disorder
K.-H. Feller, E. Gaižauskas 265

The study of protoporphyrin IX metabolism in cell proliferation using photoluminescence method
J.W. Meng, X.J. Wang, T. Lin, X.G. Ren, H.F. Pang, C.N. Zhou 271

Chapter 6. Dynamics in nanostructures and quantum confinement effects

Luminescence properties of Pr^{3+}-doped optical microcavities
A. Belarouci, F. Menchini, B. Jacquier, P. Moretti, H. Rigneault, S. Robert 275

Excitons in silicon quantum structures
Y. Kanemitsu 283

Abrupt switching and hysteresis of transmittivity of an ultrathin film consisting of J-aggregates
V.A. Malyshev, H. Glaeske, K.-H. Feller 291

Size dependence of the luminescence spectra and dynamics of Eu^{3+} : Y_2O_3 nanocrystals
D.K. Williams, H. Yuan, B.M. Tissue 297

Photoluminescence from GaAs nanocrystals by selective excitation
Y. Kanemitsu, H. Tanaka, S. Mimura, T. Kushida 301

Phonon interaction of single excitons in CdSe/ZnSe quantum dot structures
F. Gindele, K. Hild, W. Langbein, U. Woggon, K. Leonardi, D. Hommel, T. Kümmell, G. Bacher, A. Forchel 305

Dynamics of superradiant excitons in GaAs single quantum wells
P. Vledder, A.V. Akimov, J.I. Dijkhuis, J. Kusano, Y. Aoyagi, T. Sugano 309

Long-term energy storage of dendrimers
Y. Wakabayashi, M. Tokeshi, D.-L. Jiang, T. Aida, T. Kitamori 313

Fictitious forces and electronic energy relaxation in nanocrystals
H.-S. Yang, M.R. Geller 317

Micro photoluminescence spectra of CdTe and CdMnTe self-organized quantum dots
T. Kuroda, N. Hasegawa, F. Minami, Y. Terai, S. Kuroda, K. Takita 321

Chapter 7. Hole burning and photon echoes

Ultrafast optical processing with photon echoes
A. Rebane, M. Drobizhev, C. Sigel, W. Ross, J. Gallus 325

Photoionization spectral hole-burning and inversion symmetry of sites in doped insulators
A.A. Kaplyanskii, S.A. Basun, U. Happek, R.S. Meltzer 335

Laser excitation-induced structure distortion and persistent spectral hole burning of Eu^{3+} in BaFCl
G.K. Liu, S.T. Li, J.V. Beitz 343

Optical dephasing by fluctuations of long-range interactions in defect-rich crystals
V. Hizhnyakov, P. Reineker 351

Hole-burning study of exciton migration and pigment–protein interaction in photosynthetic systems
R. Dedic, M. Lovcinsky, F. Vacha, J. Hala 357

Nonradiative relaxation and inhomogeneous splitting of aggregated optical centers in the Nd^{3+}-doped CaF_2 and SrF_2 crystals (FLN and decay study)
Y.V. Orlovskii, V.V. Fedorov, T.T. Basiev, M. Altwein, B. Leu, J. Heber, S. Mirov 361

Optical properties of undoped and Eu^{3+}-doped SBN thin film grown by pulsed laser deposition
H. Liu, S.T. Li, G.K. Liu, W. Jia, F.E. Fernández 367

The dynamics of hole burning in $4f^n$–$4f^{n-1}$ $5d^1$ transition of Eu^{2+} in MgS
L. Biyikli, Z. Hasan 373

Pulse propagation in rare-earth ion doped crystals
G. Zumofen, F.R. Graf, A. Renn, U.P. Wild 379

Population hole burning on the $4f^7(^8S_{7/2})$ to $4f^6$5d zero-phonon transition in crystalline $SrF_2 : Eu^{2+}$
D.M. Boye, R.S. Meltzer 385

Inhomogeneous broadening and gated hole burning in MgS : Eu and CaS : Eu in polymethylmethacralate (PMMA)
S.M. Seyedahmadian, M.F. Aly, L. Biyikli, J.L. Park, M. Solonenko, Z. Hasan 389

Comparison of dynamics of Eu^{3+} in different Y_2O_3 nanostructured materials and with sol–gel produced SiO_2 glass
K.S. Hong, R.S. Meltzer, S.P. Feofilov, R.I. Zakharchenya, W. Jia, H. Liu, B. Tissue, H.B. Yuan 393

Chapter 8. Photodynamics of novel optoelectronic materials

Photoconductivity and delocalization in rare earth activated insulators
W.M. Yen 399

Up-conversion processes of 5d transition metal ions in crystals
D.R. Gamelin, M. Wermuth, H.U. Güdel 405

Spatially resolved second-harmonic generation in ABO_3-type ferroelectric crystals
S.E. Kapphan 411

Low-temperature optical homogeneous line width of glasses
A.J. García, R. Balda, J. Fernández 417

Chromium centers in $LiNbO_3$ revisited
G.M. Salley, S.A. Basun, G.F. Imbusch, A.A. Kaplyanskii, S. Kapphan, R.S. Meltzer, U. Happek 423

Sharp resonance modes of cubic symmetry rare-earth ions in CaF_2-type crystals
S.P. Jamison, R.J. Reeves, P.P. Pavlichuk, G.D. Jones 429

A novel luminescent center in $LiNbO_3$: Cr : Mg crystals
S.A. Basun, G.M. Salley, A.A. Kaplyanskii, H.G. Gallagher, K. Polgar, L. Lu, U. Happek 435

New spectroscopic investigation of Cr^{3+} centres in $LiNbO_3$ crystals
F. Lhommé, P. Bourson, G. Boulon, Y. Guyot, R. Burlot-Loison, M.D. Fontana, M. Aillerie, G. Malovichko 441

Influence of Al ion on photochemical conversion in germania–silica sol–gel glass
A. Leyderman, H. Zheng 447

Thermoluminescence and thermal quenching measurements in SrS : Cu
D.R. Evans, S.-S. Sun, W.M. Dennis 453

Mobility and currents of F-centers in electrolytically colored KCl crystals
L.F. Da Silva 457

Excited state impurity band conductivity in $Y_2(SiO_4)O : Ce^{3+}$
J. Choi, S.A. Basun, L. Lu, W.M. Yen, U. Happek 461

Photo-stimulated luminescence in $SrAl_2O_4 : Eu^{2+},Dy^{3+}$ single crystal fibers
W. Jia, H. Yuan, S. Holmstrom, H. Liu, W.M. Yen 465

Green and red luminescence of YSGG : Er under up-conversion and regular excitation at different Er concentrations
X. Chen, T. Nguyen, Q. Luu, B. DiBartolo 471

Fluorescence dynamics and laser properties of the $Nd^{3+} : Ca_3Ga_2Ge_3O_{12}$ crystal
D. Jaque, U. Caldiño, J.J. Romero, J. García Solé 477

Luminescence and Raman scattering of thermally reduced CaSZ crystals
D.I. Torres, J. Llopis, W. Pérez, G. Morell, R.S. Katiyar 481

Site-selectivity of up-conversion processes in Ti : Er : $LiNbO_3$ waveguides
V. Dierolf, A.B. Kutsenko, W. von der Osten 487

Confocal microscopy of color center distributions in diamond
J. Martin, W. Grebner, W. Sigle, R. Wannemacher 493

List of contributors 499

Subject index 503

Materials index 507